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ENLISTMENT PROJECTION MODEL IMPROVEMENT PROGRAM(U) ARMY 1/1
RECRUITING COMMAND FORT SHERIDAN ILL M TRAUTWEIN
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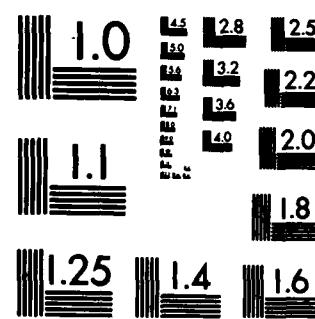
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ENLISTMENT PROJECTION MODEL

IMPROVEMENT PROGRAM

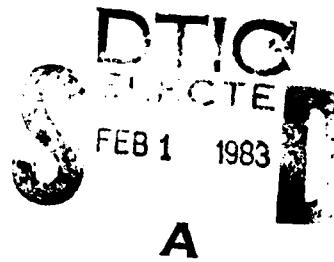
by

Dr. Marvin Trautwein

December 1982

USAREC RESEARCH NOTE 82-5

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**Research, Studies and Evaluation Division
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U.S. Army Recruiting Command
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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) The Army is trying to improve its method of assigning recruiting missions. This research note details the latest effort in this regard. The US Army District Recruiting Command missions for AFQT category I-IIIA male high school seniors and high school graduates are assigned according to a log-linear regression/forecasting model. All other mission categories are assigned according to the best available estimate of market population.		

DISCLAIMER

The views, opinions, and findings in this report are those of the author and should not be construed as an official Department of the Army position, policy, or decision, unless so designated by other authorized documents.

ABSTRACT

The Army is trying to improve its method of assigning recruiting missions. This research note details the latest effort in this regard. The US Army District Recruiting Command missions for AFQT category I-III male high school seniors and high school graduates are assigned according to a log-linear regression/forecasting model. All other mission categories are assigned according to the best available estimate of market population.

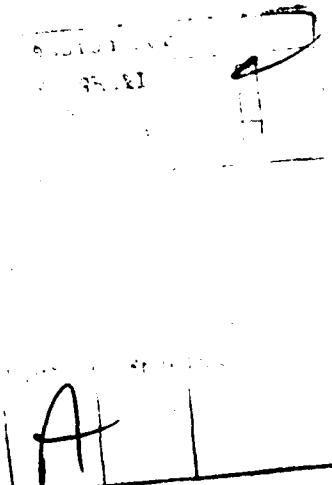
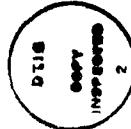


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I. BACKGROUND.

Since late 1979, Headquarters, US Army Recruiting Command (HQ, USAREC) has assigned recruiting missions to district recruiting commands (DRC) by using computer models. The mission distribution model used for allocating FY 81 and FY 82 missions is described by Fagan (1981) and Morey (1982).

Starting with a DRC quarterly data base, it used linear regression and projection to forecast seven dependent variables for the next four quarters. The forecasts were constrained to be no greater than 30 percent above the last production observation and no less than the average of the last production observation and the average of all past production. The seven forecast variables were then apportioned into 13 accession mission categories and 19 contract mission categories. The DRC percentage of the Command total in each mission category was applied to the Command mission (assigned by the Department of the Army) to give the desired mission breakout.

There were several problems with this procedure. HQ USAREC observed that nearly all forecasts constrained (either high or low) so that the regression/projection was not contributing much to mission assignment. Morey (1982) recommended many changes, among them the use of a nonlinear multiplicative model, a monthly data base, more detailed advertising data, limiting modeling efforts to supply-limited mission categories, and the use of Park's regression.

II. RECENT CHANGES.

During October and November 1982, the model was subjected to many experimental changes. The result of these experiments is a model that attempts to forecast only for AFQT category I-IIIA high school senior/high school graduate male contracts. The model used is multiplicative-exponential, linear in logs, and thus solvable by ordinary least squares. Hispanic population was added to the set of independent variables. REACT leads (coupons from magazine advertisements) and recruiters' aides were dropped. The dependent variable and all independent variables that were not rates already, were divided by high school seniors, putting the model on a "per-high-school-senior" basis. R^2 s (correlation coefficient) from the resulting five regional recruiting command regressions are shown in Table 1. All appear acceptable except Southwest, which needs more work. Adjusted R^2 is a better statistic for explaining the variance than R^2 , because it compensates for the loss in degrees of freedom in fitting the model. (In the extreme, one can get perfect R^2 's by using a large enough number of independent variables.)

Table 1. Regression correlation coefficients for regional recruiting commands.

<u>Region</u>	<u>R^2</u>	<u>Adjusted R^2</u>
Northeast	.98	.98
Southeast	.84	.82
Southwest	.59	.56
Midwest	.78	.74
Western	.86	.83

The five region equations are evaluated with DRC projected independent variable data to produce DRC forecasts for the next four quarters. These forecasts appear quite reasonable without the use of constraints.

Since the model forecasts only for AFQT category I-IIIA senior and graduate males, other mission categories must be allocated by other means. To this end, a market population data set was developed for the 56 DRC for the different categories of contract missions. Data were found for all categories except non-high school graduates. Past production was substituted in these categories temporarily. For a given DRC, the ratio of AFQT category I-IIIA senior males to category I-IIIA high school graduate males was used to divide the projected category I-IIIA graduate senior male number into seniors and graduates. Then, as in the previous model, the DRC percentage of Command was computed for each mission category and used to allocate Command mission.

III. FUTURE IMPROVEMENTS

More detailed advertising expenditure data, disaggregated to months, have been requested. When these become available, the model's data base will be made monthly, to allow for analysis of lags. Park's regression may be available by summer of 1983, when the Statistical Analysis System is expected to be available for HQ USAREC UNIVAC computers. Hopefully, valid data will be found for non-high school graduate population. Southwest region needs further analysis aimed at improving the anemic R^2 . As Morey strongly suggests, the model should be validated against production data.

IV. REFERENCES.

1. Morey, Richard C., and McCann, John M., "The Army's Enlisted Production Model: A Critique and Suggested Directions for the Future", unpublished research report, The Fuqua School of Business, Duke University, August, 1982.
2. Fagan, Thomas W., "USAREC Distribution Model," unpublished paper, Department of Economics, U.S. Military Academy, October, 1981.

ENLISTMENT PROJECTION MODEL

HISTORICAL DATA BASE AS OF 12-16-82

USARCPAE-RE DR. TRAUTWEIN PHONE: (312) 926-2679 (R) 456-2679

<u>VARIABLES</u>			
NAME	MEANING	NAME	MEANING
TIME	FISCAL YEAR-ZERO-QUARTER	BOB MPSN ACCH	BOB NON-PVTOR SERVICE MALE ACCESSIONS
BRC	DISTRICT RECRUITING COMMAND CODE	BOB HSDGN ACCH	BOB HIGH SCHOOL DIPLOMA GRADUATE MALE ACCESSIONS
AREA	BRC AREA IN SQUARE MILES	INCME	MEDIAN DISPOSABLE FAMILY INCOME
QPA	QUALIFIED MIL-ARY AVAILABLE	BLACK POP	BLACK POPULATION
HISP	HISPANIC POPULATION	ARMY MALE CONT	ARMY MNG MALE CONTRACTS (INC 1-3A)
HS CHRS	MALE HIGH SCHOOL SENIORS (INC 1-3A)	ARMY HS6 CONT	ARMY HIGH SCHOOL GRADUATE (INC 1-3A) MALE CONTRACTS
RCTR	ON-PRODUCTION ARMY RECRUITERS	ARMY ENLT PROP	ACTIVE ARMY ENLISTMENT PROPENSITY
ARMY MPSN ACCH	ARMY NON-PVTOR SERVICE MALE ACCESSIONS	RTNF MAMMO	HOMETOWN RECRUITER RATES (AVERAGE)
ARMY HSDGN ACCH	ARMY HIGH SCHOOL DIPLOMA GRADUATE MALE ACCESSIONS	ARMY 1-3A MPSN	ARMY INC 1-3A MALE ACCESSIONS
UNEMP	BRC OVERALL UNEMPLOYMENT	ARMY PS TOT	ARMY PVTOR SERVICE TOTAL ACCESSIONS
RCTR EXP	PERCENT OF BRC RECRUITERS WITH ONE OR MORE YEARS EXPERIENCE	ARMY MPS FEM	ARMY GRAD-SP FEMALE CONTRACTS (INC 1-3A)
ARMY RCTR BOB	ARMY RECRUITERS AS PERCENT OF BOB RECRUITERS BY BRC	BOB ARV	BRC LOCAL ADVERTISING EXPENDITURES

ENLISTMENT PROJECTION MODEL

HISTOPICAL DATA BASE

USGS-PDF-05

ENLISTMENT PROJECTION MODEL

PROJECTION DATA BASE AS OF 12-16-82

USADCPRE-RE DR. TRAUTWEIN PHONE: (312) 926-2679 (A) 459-2679

VARIABLES

NAME	MEANING	NAME	MEANING
TIME	FISCAL YEAR-ZERO-QUARTER	NDP_NPSM_ACCH	NOD NON-PRIOR SERVICE MALE ACCESSIONS
DRC	DISTRICT RECRUITING COMMAND CODE	NDP_HSGRM_ACCH	NOD HIGH SCHOOL DIPLOMA GRADUATE MALE ACCESSIONS
MRAEA	DPC AREA IN SQUARE MILES	INCOME	MEDIUM DISPOSABLE FAMILY INCOME
AMIA	HIGH 1-3A MILITARY AVAILABLE	BLACK_POP	BLACK POPULATION
HISP	HISPANIC POPULATION	ARMY_HSG_CONT	ARMY HSG MALE CONTRACTS (INC 1-3A)
HS_SRHS	MALE HIGH SCHOOL SENIORS (INC 1-3A)	ARMY_HSG_CINT	ARMY HIGH SCHOOL GRAD/SR (INC 1-3A) MALE CONTRACTS
RCTPS	ON-PRODUCTION ARMY RECRUITERS	ARMY_ENLST_PROP	ACTIVE ARMY ENLISTMENT PROPENSITY
MRRY_NPSM_MCLN	ARMY NON-PRIOR SERVICE MALE ACCESSIONS	RTDE_RNMHD	HOMETOWN RECRUITER RTDES (AVERAGE)
ARMY_HSGRM_ACCH	ARMY HIGH SCHOOL DIPLOMA GRADUATE MALE ACCESSIONS	ARMY_1-3A_NPSM	ARMY NC 1-3A MALE ACCESSIONS
UNEMP	DPC OVERALL UNEMPLOYMENT	ARMY_PS_TOT	ARMY PPTOP SERVICE TOTAL ACCESSIONS
RCTP_EXP	PERCENT OF DPC RECRUITERS WITH ONE OR MORE YEARS EXPERIENCE	ARMY_NPS_FEM	ARMY GRAD-SD FEMALE CONTRACTS (INC 1-3A)
ARMY_RCTR_NOD	ARMY RECRUITERS AS PERCENT OF NOD RECRUITERS BY DPC	DPC_ARV	DPC LOCAL ADVERTISING EXPENDITURES

ENLISTMENT PROJECTION MODEL

PROJECTION DATA NOSE

USGS/PNHC-PE

ENLISTMENT PROJECTIONS
COBB-DOUGLAS MODEL

FOR COMMAND LEVEL: ALBANY DRC -RRC COEFFS

DEPENDENT VARIABLE: MSGCOM R²= .97861

REGRESSION COEFFICIENTS

HREA =	-.18498	DMA =	.38363	REACT =	-.11228	HSSMR =	.00000
RUTRS =	1.73200	UNEMP =	.31210	RCTREX=	.46430	INCOME=	1.44679
BLACKS=	-.11126	PROOPEN=	.89080	RIDES =	.00000	BDRCR=	-.82573
DOM =	.00000	BDMH =	.00000	ANYCDS=	.00000	MEVAR =	.00000
SEVAR =	.00000	SUVAR =	.00000	MUVAR =	.00000	Q1VAR =	.00000
Q2VAR =	.21416	Q3VAR =	.00000	BRCADV=	.00000	POLICY=	.00000
CONST=	-18.39925						

MSGCOM PROJECTIONS

QTR1= 127. QTR2= 162. QTR3= 134. QTR4= 124. YEAR= 547.

ENLISTMENT PROJECTIONS
COBB-DOUGLAS MODEL

FOR COMMAND LEVEL: BALTIMORE DRC -RRC COEFFS

DEPENDENT VARIABLE: MSGCOM R²= .97861

REGRESSION COEFFICIENTS

HREA =	-.18498	DMA =	.38363	REACT =	-.11228	HSSMR =	.00000
RUTRS =	1.73200	UNEMP =	.31210	RCTREX=	.46430	INCOME=	1.44679
BLACKS=	-.11126	PROOPEN=	.89080	RIDES =	.00000	BDRCR=	-.82573
DOM =	.00000	BDMH =	.00000	ANYCDS=	.00000	MEVAR =	.00000
SEVAR =	.00000	SUVAR =	.00000	MUVAR =	.00000	Q1VAR =	.00000
Q2VAR =	.21416	Q3VAR =	.00000	BRCADV=	.00000	POLICY=	.00000
CONST=	-18.39925						

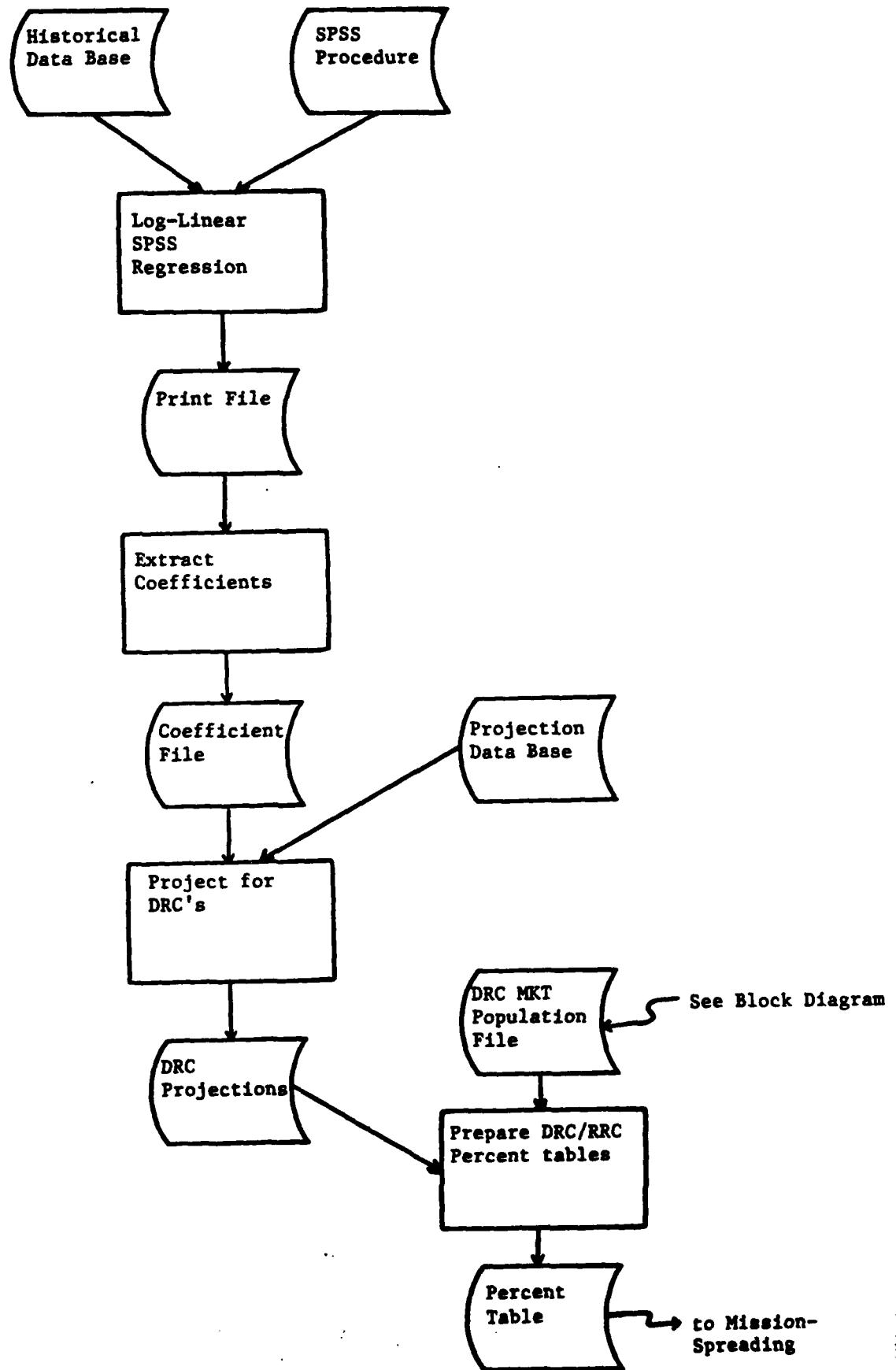
MSGCOM PROJECTIONS

QTR1= 346. QTR2= 441. QTR3= 346. QTR4= 336. YEAR= 1489.

Missions

TEST RUN FOR RESEARCH NOTE.												RIM 12-16-82 AT 1200												
(A)	(M)	(N)	(O)	(D)	(C)	(D)	(F)	(F)	(F)	(F)	(F)	PS	(M)	(D)	(M)	(N)	(F)	(F)	(F)	TOTAL				
IIIA	IIIB	IIIC	IIID	IV	IV	IIIA	IIIB	IIIC	IIID	IIIA	IIIB	IV	IV	IV	IV	IV	IV	IV	IV	IV	IV	IV	IV	
HSSP	HSDG	HSSP	HSDG	HSSP	HSDG	HSSP	HSDG	HSSP	HSDG	HSSP	HSDG	HSSP	HSDG	HSSP	HSDG	HSSP	HSDG	HSSP	HSDG	HSSP	HSDG	HSSP	HSDG	
COMMAND: ATLANTA																								
RE-FY830	99	224	40	58	0	143	37	48	5	40	0	19	0	0	35	139	425	85	649	5	59	64	748	
RE-FY830	99	224	40	58	0	143	37	48	5	40	0	19	0	0	35	139	425	85	649	5	59	64	748	
COMMAND: BECKLEY																								
RE-FY830	43	96	23	32	0	53	28	7	3	21	0	10	0	0	11	66	181	35	282	3	31	34	327	
RE-FY830	43	96	23	32	0	53	28	7	3	21	0	10	0	0	11	66	181	35	282	3	31	34	327	
COMMAND: CHARLOTTE																								
RE-FY830	60	128	31	42	0	63	46	15	4	32	0	14	0	0	26	91	233	61	385	4	46	50	461	
RE-FY830	60	128	31	42	0	63	46	15	4	32	0	14	0	0	26	91	233	61	385	4	46	50	461	
COMMAND: COLUMBIA																								
RE-FY830	82	183	29	41	0	75	44	11	3	25	0	13	0	0	31	111	299	55	465	3	38	41	537	
RE-FY830	82	183	29	41	0	75	44	11	3	25	0	13	0	0	31	111	299	55	465	3	38	41	537	
COMMAND: JACKSONVILLE																								
RE-FY830	132	304	42	61	0	119	160	0	7	56	0	21	0	0	64	174	484	160	818	7	77	84	966	
RE-FY830	132	304	42	61	0	119	160	0	7	56	0	21	0	0	64	174	484	160	818	7	77	84	966	
COMMAND: LOUISVILLE																								
RE-FY830	90	194	36	58	0	71	75	0	5	37	0	16	0	0	23	126	315	75	516	5	53	58	597	
RE-FY830	90	194	36	58	0	71	75	0	5	37	0	16	0	0	23	126	315	75	516	5	53	58	597	
COMMAND: MIAMI																								
RE-FY830	97	205	32	44	0	62	103	22	4	35	0	16	0	0	31	129	311	125	565	4	51	55	651	
RE-FY830	97	205	32	44	0	62	103	22	4	35	0	16	0	0	31	129	311	125	565	4	51	55	651	
COMMAND: MONTGOMERY																								
RE-FY830	108	238	40	57	0	146	58	41	5	35	0	19	0	0	36	148	441	99	688	5	54	59	783	
RE-FY830	108	238	40	57	0	146	58	41	5	35	0	19	0	0	36	148	441	99	688	5	54	59	783	
COMMAND: NASHVILLE																								
RE-FY830	92	205	51	71	0	109	80	7	7	53	0	23	0	0	33	143	385	87	615	7	76	83	731	
RE-FY830	92	205	51	71	0	109	80	7	7	53	0	23	0	0	33	143	385	87	615	7	76	83	731	
COMMAND: RALEIGH																								
RE-FY830	77	162	34	46	0	73	36	11	4	27	0	15	0	0	27	111	281	47	439	4	42	46	512	
RE-FY830	77	162	34	46	0	73	36	11	4	27	0	15	0	0	27	111	281	47	439	4	42	46	512	
COMMAND: RICHMOND																								
RE-FY830	101	208	32	42	0	66	45	55	5	37	0	18	0	0	48	133	316	100	549	5	47	52	641	
RE-FY830	101	208	32	42	0	66	45	55	5	37	0	18	0	0	48	133	316	100	549	5	47	52	641	
COMMAND: SAN JUAN																								
RE-FY830	23	44	9	11	0	41	12	11	1	4	0	4	0	0	33	32	96	23	151	1	8	9	193	
RE-FY830	23	44	9	11	0	41	12	11	1	4	0	4	0	0	33	32	96	23	151	1	8	9	193	
COMMAND: SOUTHEAST FRC																								
RE-FY830	1004	2191	399	555	0	1021	724	228	53	402	0	180	0	0	398	1403	3767	952	6122	53	582	625	7147	
RE-FY830	1004	2191	399	555	0	1021	724	228	53	402	0	180	0	0	398	1403	3767	952	6122	53	582	625	7147	

RUN CHART



BLOCK DIAGRAM

